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THE ROLE OF TELEWORKING IN BRITAIN: ITS IMPLICATIONS FOR THE TRANSPORT SYSTEM AND ECONOMIC EVALUATION

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INTRODUCTION

Interest in the concept of 'teleworking' (hereinafter 'TW'), also known as 'telecommuting', has grown rapidly in recent years. The widespread availability of appropriate technology, noticeably personal computers (PCs) at home linked by broadband, has greatly reduced some of the barriers previously found. A direct substitution of home to work travel may offer extensive scope for reducing total distance travelled, especially at peak periods. This may produce time savings for the worker concerned and also wider benefits such as reduced congestion and pollution, costs of peak capacity provision in public transport, and financial savings for employers.

In addition, there has been a growth in 'teleconferencing' (hereinafter 'TC') in which communications technology is used to enable conferences and meetings to take place remotely. Here, the technology is still advancing, notably in video-conferencing. Broadly similar impacts may be foreseen, but focussed more strongly on reducing the need for less frequent long-distance travel rather than local commuting. This paper concentrates on the TW aspects.

This study was based on interviews with nineteen organisations in the London area, paralleled by an extensive analysis of data from the National Travel Survey (NTS) in Britain, plus a review of existing literature, primarily from Britain and the USA. The NTS data identified the proportions and distributions of days worked at home within the overall working total. The interviews identified the perceptions of senior management with respect to both TW and TC. In the light of this evidence, the implications for economic evaluation, and possible future trends, were then examined.

Interviews and most of the analysis were carried out in the first half of 2006, and NTS data analysed in detail is from the aggregate sample obtained in 2002 to 2004 inclusive. Reference is also made in this paper to subsequent trends and more recent published research by other authors.

The growth and potential impact of teleworking has been noted by many writers. However, as Button et al (2006) observe, the empirical evidence for change is often limited.

DEFINING AND MEASURING TELEWORKING

A wide variety of definitions is in use. One could, for example, define 'teleworkers' as those who work entirely from home. This proportion, however, appears to be very small. The NTS indicates a fairly stable proportion of about 3% of all workers following this pattern, a figure which also includes some traditional home-based occupations, although two-thirds of such respondents indicated without access to a computer and/or telephone it would not be possible for them to work at home¹. Much broader definitions include those who occasionally telework from home, although working mostly at traditional places of work remote from their home, typically an office. This is reflected in some popular press coverage – for example, a statement that “teleworkers account for some 12 per cent of the workforce” in London and the South East (McRae, 2006).

Some confusion arises from the fact that much teleworking takes the form of a mix of traditional workplace activity, with some days spent working at home. For more frequent teleworkers of this type, one or two days per week at home may be typical, but less frequent patterns are also found. Evidence from the interviews with organisations suggested that much of this is of an informal or 'ad hoc' basis, agreed between the worker and their immediate manager, making accurate measurement difficult even within organisations in which it is practised. Conversely, formal contracts specifying arrangements of teleworking seemed to be much less common.

A further factor is the existence of 'nomadic' workers who do not work from a fixed base, but may be highly mobile, working partly from home, and partly at places visited in the course of work, with occasional visits to the organisation's own offices. Examples include repair and sales staff. For these staff, communication with management and colleagues has been greatly improved through telecommunications, but has not necessarily caused a direct substitution of journeys made from home.

A broad indication is given by the Labour Force Survey (LFS) reports. It found that 2.6% of workers worked mainly from home, 7.5% worked from home at least once a week and 23% sometimes worked from home. Of the group working from home, 80% used computers and telephones in their work (Halford, 2005).

Analysis of the 2002-2004 data from the NTS gave a similar picture, with 3.1% working at home or within the same building, and 96.9% usually working at another location away from home. However, a substantial proportion, 19.9% of the labour force, worked 'at different places away from home' rather than the same place every day. This could include some of the 'nomadic' staff mentioned above.

The NTS permits patterns to be examined in more detail, showing that 4.9% of those whose usual workplace was outside the home, worked some or all days at home in the previous week, averaging 2.3 days each. This would imply that about 2% of all working days are worked at home by those doing so

at least once a week, in addition to the 3% always working at home or in the same building. For Greater London and the South East these proportions were slightly higher, some 7.5% of respondents having worked at least one day at home in the previous week, with a similar average of 2.3 days each, implying about 35% of all days being worked in this form.

In addition to data from the survey week, the NTS also includes questions about less frequent pattern of working from home. In 2002-2004, a further 6.3% of respondents indicated working at home less than once a week, but at least once a year.

Hence a distinction may be drawn between *teleworkers* – those people (expressed as a proportion of the whole workforce) who telework from home at or above a specified frequency – and the proportion of *teleworking*, i.e. those days from within the annual total for the whole labour force which are worked at home. The latter is typically much lower than the former, and this may lead to some confusion in reported levels of activity between different sources.

A limitation of both the LFS and NTS is that whole days worked are assigned either to the normal workplace or working at home. Furthermore, the NTS excludes additional work undertaken outside of the respondent's normal working hours, which will tend to understate the total of work done at home. A further pattern becoming evident is that work may be undertaken on the same day both at the traditional working place, and at home – for example, as additional work in the evening, or in the morning to avoid travelling at peak periods. A study by Lyons et al (2006), taking a set of internet users, showed that 14% of the sample undertook at least one day in a five-day working week of working both at home and usual workplace on the same day, compared with 6% who undertook at least one full day of homeworking, with little overlap observed between the two groups.

WHO ARE THE TELEWORKERS?

Sources such as the LFS, NTS and organisation interviews also help to define the type of person engaged in teleworking. By definition, this will be limited to types of work that can be undertaken at home, such as writing a report, and will largely exclude many manual occupations, or service occupations that require direct interaction with the customer (such as catering). A consequence of this may be that those in more senior managerial positions are more likely to telework, both due to the nature of their work, and their status, which may result in greater discretion being given as to how work is carried out – in some cases, management is moving to an emphasis on 'outcomes' (e.g. completing a report), rather than a fixed number of hours being worked at the traditional workplace.

The LFS indicates that about 12 to 14% of those classified as 'managers and senior officials', 'professional occupations', 'associate professional and technical', 'administrative and secretarial', and 'skilled trade' engage in teleworking. The first three of these categories represented 68% of all

teleworkers in 2002, as cited by Cairns et al (2004). Conversely, in 'personal services', 'sales and customer services', and 'process, plant and machine operatives' only about 8% teleworked, representing in aggregate only 7% of all teleworkers.

The NTS suggests a similar pattern by employment group, and also a strong association between income levels and teleworking. Of those who had worked at home one day or more in the previous week, 18% had an income of £40,000 or over, and 46% between £20,000 and £39,999: comparable percentages for those 'usually working at another location' were 6% and 31% respectively.

In the organisation interviews, it was reported that those in middle to senior management positions, and the 'nomadic workforce', were more likely to engage in teleworking. Some 8 of the 19 organisations stated that employees from any level of the organisation could telework (assuming that their work activities could be done from home), but the remaining 11 stated that currently only managers and those in senior positions could telework.

The implication is that where personal benefits arise from teleworking, these tend to accrue to higher status and higher income groups. Where an economic evaluation of effects on their productivity is being made, a higher-than-average value might be assigned to additional working hours made possible by teleworking (discussed further below).

BENEFITS AND COSTS OF TELEWORKING

The most obvious benefit from teleworking is reduced home to work travel. For the employee, this will give benefits through reduced time spent in travel, and savings in fuel costs, public transport fares etc. Additional benefits, although harder to measure, may come from reduced stress associated with commuting, the ability to work uninterrupted at home, and the ability to deal with household tasks during the working week.

For the employer, reduced travel time and cost may provide indirect benefits through higher productivity during hours worked, and also the possibility of more hours being worked per day where travel time is replaced by work time. Reduced stress may improve quality of work and reduce staff turnover. Where a substantial change in the proportion of the workforce at the traditional workplace on any one day occurs, then the numbers of workspaces may be reduced, notably through 'hot desking', providing savings in office rentals and running costs (such as heating). Employers may also be able to recruit from a wider range of potential staff, such as those with child-care requirements that preclude normal office hours.

Against this, the individual worker may experience some feelings of isolation and possible loss of status in the workplace. Additional costs may be incurred in lighting and heating of the home, and provision of office space. The employer may lose the ability to control the quality of work being undertaken, and there may be a loss of the benefits of interaction between workers. Data

security may also be an issue, although in most cases organisation interviews indicated that it may be overcome with appropriate software.

A more general issue is that of management attitudes and perceptions. Teleworking may be seen as 'counter-cultural' to the ethos of the organisation, as a result of reducing face-to-face contact, and accessibility of staff to management. This issue is also raised by Button et al (2006, page 66).

For these reasons, the mix of home-based teleworking and traditional working, often within the same week as described above, is attractive both to workers and employers, enabling some days to be worked at home while not losing the benefits of interaction with colleagues and access to facilities at the place of work. This is often of an informal nature.

In addition to gains and losses experienced by workers and employers, there may be wider external effects, notably through reduced home to work commuting, with consequent reduction in traffic congestion and pollution. There are particular benefits in reducing (or retiming) journeys at existing peak demand periods, both in terms of congestion, and cutting the peak-only public transport additional capacity. Most studies to date, especially in the USA, have evaluated transport benefits in terms of car use. Given single-occupancy driving as the norm for journeys to work, a *pro rata* reduction might be assumed in vehicle-km when such journeys are eliminated. In the case of public transport, resource savings are only made when a change to the pattern of timetabled services occurs, or reduction can be made in peak capacity (such as train length). This is particularly relevant to the London case, where a very high proportion of commuting journeys are already made by public transport to and from the central area, so that it is changes within the public transport market, rather than car use or modal shift, which are of greatest importance. Reduced crowding on existing services may provide benefits for remaining travellers, and/or permit some currently frustrated demand to be met.

The existing literature provides a wide range of estimates for the net reduction in weekly travel. A sample of studies, principally from the USA, indicates reductions in car mileage of between 48% and 77% on teleworking days, with a reduction of between 9% and 11% over the week as a whole when traditional working days are also included (Balepur et al, 1998; Koeing et al, 1996; Jensen et al, 2003). There may be some offsetting effects when additional journeys undertaken from home on teleworking days are included. However, these tend to be relatively short, so that a substantial net reduction is still observed. For example, the SUSTEL study as quoted by Hopkinson and James (2003) found a reduction in commuting distance of 61 miles (98 km) a week on average for those who took up teleworking. An additional weekly total of 16 miles (26 km) on other trips still produced a net reduction of 45 miles (72 km) per week. Geraghty and Fogarty, as cited in Cairns et al (2004) found through a sample of internet users that average mileage saved per day was 16.3, partly offset by additional non-work-related car journeys of 4 miles, a net saving of 12.3 miles (19.8 km) per day.

A qualification in the use of such studies is that relatively high levels of car mileage are often reported in the pre-teleworking stage, and hence also in the net savings produced. This may be partly a function of the higher income and status of those engaged in teleworking, which in turn tends to be associated with longer home to work commuting trips than the national average.

Translated into nationwide terms, the net savings in car mileage are much less, due to the small proportion of the total working days covered through teleworking, estimates from the USA giving 0.8% (Choo et al, 2005) and 1% (Mokhtarian, 1998).

IMPLICATIONS FOR CHANGES IN TOTAL DISTANCE TRAVELLED

In the simple case of traditional home to work commuting being replaced by working at home, either full-time or on a certain proportion of days worked, then a *pro rata* reduction is obtained in distance travelled. This may be offset to some extent by additional journeys undertaken on home-worked days, but as indicated in sources cited above, this appears relatively small and a large net reduction in total travel is observed.

However, a complication arises from the fact that home and work locations are not fixed – there is a large element of ‘churn’ in both factors. It could be the case that removing the need to travel so frequently makes a longer commuting journey feasible, and hence, while commuting trips would fall, there might not be a corresponding reduction in total distance travelled. In the London area in particular, house prices are now very high and, as some interviews with organisations confirmed, teleworking could be a means by which it is practicable to live at an affordable (but greater) distance from central London. A further complication in use of cross-section data arises from the fact that the higher income and status of those who telework will tend to be correlated with higher car ownership, and greater distances between home and the traditional workplace.

Subject to these qualifications, the 2002-2004 NTS data enables relationships between distances travelled and frequency days at home to be described.

Care is required in using NTS data, due to effects of cluster sampling. Hence, larger sample sizes are required than for random sampling from the whole population. A minimum sample size of at least 300 individuals is advised¹, which applied in this case for all except for ‘less than once a week, more than twice a month’, at 242.

The following distribution was observed (see table 1):

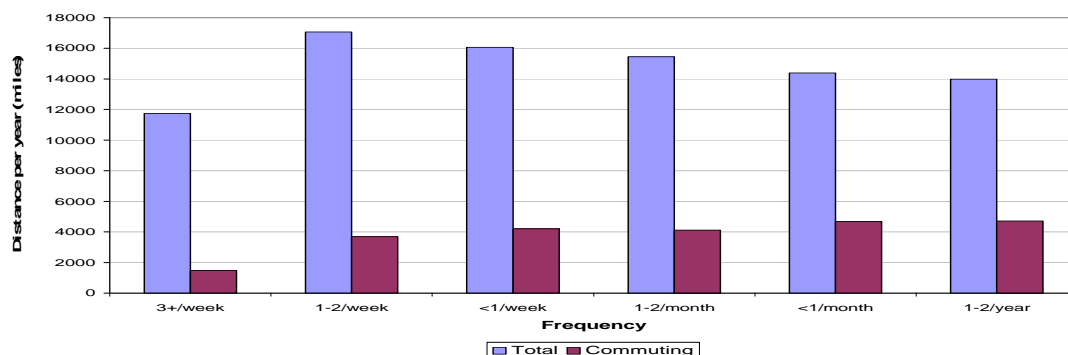
Table 1: Total distance travelled by frequency the respondents work at home (miles), NTS sample 2002-2004

Frequency of working at home	Total distance per year	Distances reported as 'commuting'
Three or more times a week	11,752	1,472
Once or twice a week	17,069	3,702
Less than once a week, more than twice a month	16,074	4,211
Once or twice a month	15,446	4,112
Less than once a month, more than twice a year	14,387	4,682
Once or twice a year	13,982	4,716

These relationships are also illustrated in figure 1. It is noticeable that all sub-groups exceed the average reported by working-age males in 2004 (around 11,000 miles, or 17,700 km). One might expect that as the number of days worked at home rose, total distance would fall. However, this only becomes evident at the highest frequency, of three or more times a week, which displays a drop of 31% from the figure for the 'once or twice a week' category. This is associated not only with a reduction in commuting, but also in 'business' travel and some other purposes.

Figure 1: Distance travelled per year by frequency of working at home

Source: NTS data as in table 1



When these frequency groups are compared, there is not only a high level of 'commuting' as such (about 4,000 miles per year, or 6440 km), but also a high and growing level of 'business' travel (from 2,611 miles per year [4201 km] in the 'once or twice a year' group to 5,702 miles [9175 km] in the 'once or twice a week' group). This may correspond with the need to attend periodic business meetings rather than liaising with colleagues on a day-to-day basis

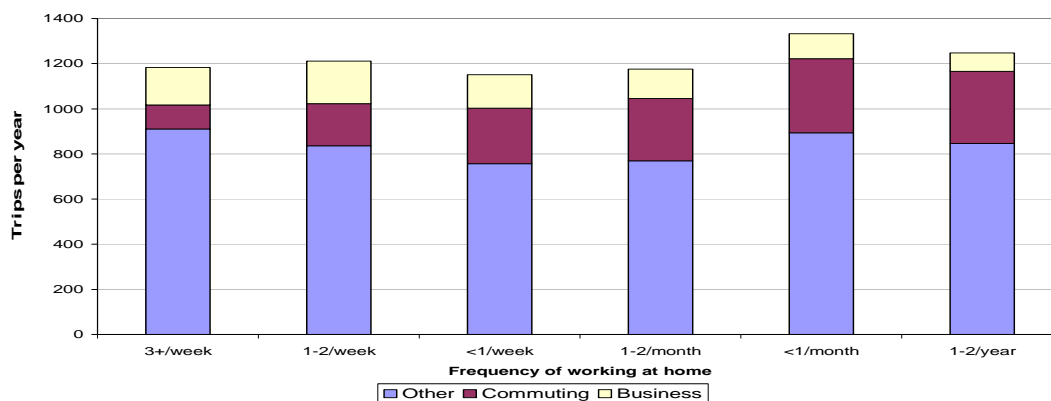
at a regular place of work. There does not seem to be a simple observed relationship between commuting and business travel, probably due to an association between working at home and greater average distances between home and work which in turn is related to income and occupation.

As indicated earlier, there is a correlation between income and greater distances travelled. Nonetheless, it is noteworthy that exceptionally high average total distances were reported for those working at home once or twice a week (17,069 miles, or 27,464 km) but within this group those on higher income had higher distances still (19,026 miles, or 30,613 km) for those on £20,000 to £39,999; and 22,439 miles (36,104 km) for those over £40,000, albeit on smaller samples than 300.

In addition to examining distance as such, total trip volumes can be tabulated against frequency of working at home.

Figure 2: Trips per person per year by frequency of working at home

Source: NTS data 2002-2004



In the chart above the highest figure is for the ‘less than once a month, more than twice a year’ category at 1,332, lowest for ‘three or more times a week’ at 1,183. Hence, the aggregate variation in distance is largely explained by variation in average trip length. There is no systematic trend in total trips per year by frequency of working at home, the overall average being about 1200, but a variation is found in the proportion of commuting (lower at high frequencies of working at home, as might be expected) and business (higher).

By mode, the greatest variation was in rail use (underground, surface rail and light rail combined) which peaked at 84 trips per person per year in the ‘once or twice a year’ category, falling to 14 for ‘three or more times week’. While this might be expected, given the close link between rail use and commuting, the fact that the car driver mode showed a much smaller drop does raise questions about sustainability and teleworking.

However, caution remains regarding the possible cause and effect relationship between frequency of working at home and teleworking. A study by Ory and Mokhtarian (2005) in California indicated that, while teleworkers were shown in cross-section data to have a greater total commuting distance, a panel survey enabled a distinction to be drawn between those who had started teleworking only after moving house, and those teleworker who had moved house since starting teleworking. Those who relocated after becoming teleworkers moved closer to their place of work.

ECONOMIC IMPACTS OF TELEWORKING

Economic impacts principally comprise those resulting from changes in the total volume of travel, accommodation costs incurred by employers and employees, and possible changes in productivity by employees.

In the illustrative examples shown below, the focus is entirely on the travel costs and productivity changes. While savings in rentals and office space maintenance by employers may be substantial, one must bear in mind in any comprehensive economic assessment that some increased costs may be incurred by employees through working at home. Changes in staff morale, turnover, etc. may be important but are difficult to quantify, and likewise there may be some disbenefits to employees through isolation from work colleagues. The costs of setting up equipment for teleworking appear very small, since in many cases powerful PCs and broadband connections are already in place.

Guidance for economic evaluation of transport changes provides hourly time values - taking those values advised in 'WebTAG' (the Department for Transport website providing official guidance on evaluation methods) at April 2006 (themselves at 2002 prices) the following hourly rates were recommended:

- Time in the course of paid work (average of person types and modes) £22.11
- Commuting (for all persons) £ 4.17
- Other time (for all persons) £ 3.68

Hence, reductions in commuting time may be valued at the rate above. Note, however, that these rates are generally used in analysis of *marginal* changes, such as speeding-up an existing trip, rather than elimination of whole trips which is being considered here.

Several possible scenarios may be envisaged:

1. A person works at home on certain days of the week. The value of work done for the employer is not changed, and savings accrue as benefits to the employee, in terms of 'commuting' time and monetary travel costs

2. The worker may regard their time spent away from home (including that in 'commuting') as work time. Hence, without reducing personal time at home, productivity is increased through hours formerly spent in travel being spent in work. For example if a person had a one hour travel time between home and work, and two days were worked at home, the four hours saved could be spent in working (assuming that no work is currently done during the journey), for which the much higher hourly value would be appropriate. A recent survey of BT staff who switched to teleworking partly supports this (James et al, 2006) – about 4.4 hours were saved by working at home, on average 2.11 days per week, of which more than half was devoted to work purposes. Given the high average income levels of teleworkers (see above) a higher rate than the national average used in evaluation could be appropriate.
3. Home to work distance increases as a result of teleworking enabling a longer distance to be acceptable. This partly offsets the reduction in total distance and monetary travel costs that would be expected from a simple *pro rata* reduction.
4. A much greater increase occurs in home to work distance, but as a result the longer journey enables a useful 'block' of time to be worked while in travel, when rail is the main mode used. While transport evaluation methods have traditionally classified all travel time as 'wasted' there is growing evidence that part of the time spent on long-distance rail journeys may be used in a worthwhile way, either for personal benefit (e.g. reading a book) or on behalf of the employer (e.g. use of laptop). A recent study for Virgin Trains (Kirby et al, 2006) found that for train journeys of 1 to 3 hours duration nearly seven out of ten business travellers will do some work whilst in the train, averaging about one third of all in-train time. One can thus envisage a scenario in which a worker decides to regularly undertake a substantial proportion of their work by teleworking (for example, two days per week), while commuting to a traditional office on the other three. A much greater distance is travelled but a substantial proportion of the journey time is spent productively.

An illustrative case of some possible changes is provided in Table 2 below, the following assumptions being made:

- Public transport fares 15p/km
- No extra travel on days worked at home
- Travel time savings valued at £4.50 per hour OR where time saved from travel is used for work on behalf of the employer, it has a value of £25 per hour.
- All home to work journeys are currently made by public transport

- The normal working month comprises 20 working days, and the average distance between home and work prior to teleworking is 10 km.
- Of 100 workers, all initially working full-time at the traditional workplace, the following changes occur:
 - three become full-time teleworkers based at home
 - five work three days per week at home, but their trip length increases to 15 km
 - a further five work two days a month at home, without changing their trip length.

These proportions are broadly in line with those estimated from the NTS.

The combined effect of these changes would be to reduce peak demand on the public transport network (assuming no retiming of trips) by about 9%. Total distance travelled would reduce by about 5.5%, and hence (at a given rate per kilometre) public transport revenues would fall by the same proportion (but costs would fall by a greater figure). Summary results are shown in table 2.

The economic benefits are dominated by additional work output (if applicable), if travel time saved is converted to work valued at £25/hour.

Note that some additional effects could occur, possibly including some additional short journeys on days worked at home, which are more likely to be by car, reducing some of the resource cost savings shown.

Table 2: Illustrative Economic Benefits from a shift to teleworking

Notional sample of 100 workers (as specified above)

Category (and number of persons)	Change in km travelled per month	User cost savings @15p/km (£/month)	Personal travel time savings @ £4.50/hour (£/month)	OR Travel time savings worked @ £25/hour
Full-time teleworkers (3)	-1200	180	270	1500
Working at home 12 days per month (5)	- 800	120	180	1000
Working at home 2 days per month (2)	- 200	30	45	50
Totals	-2200	330	495	2550

Of course, a wider range of values and assumptions could be tested in these calculations. What is evident, however, is the dominance of benefits arising from travel time savings being converted into productive work. Even if only half the time savings were converted in this way, they would still substantially exceed the personal user cost savings. Indeed, given the higher average income levels of teleworkers, a somewhat higher value of time in course of work could be appropriate.

Insofar as peak fare levels do not fully reflect costs of peak-only provision, the full economic transport cost savings would be somewhat greater than shown here.

A particular issue for public transport operators is whether the reduction in peak demand would be evenly spread throughout the week. At present, some peak capacity is only used for ten trips a week (one in each peak, Monday to Friday). The danger is that teleworking could, be concentrated on certain days of the week, such as Fridays, leaving to an even worse peak utilisation level (capacity being used for only eight trips per week). However, the NTS data indicates a very even distribution of days worked at home over the Monday - Friday period, so in practice this danger may not arise.

SOME SUGGESTED TRENDS

It is clear that considerable scope exists for further extension of teleworking, as organisations and their staff become more aware of the wider benefits it may produce. However, establishing a forecast for this trend is very difficult, since much of the expansion appears to be of an informal nature, rather than based on organisation-wide policies. Furthermore, much of the teleworking is undertaken through a mix of work at home and in the organisational workplace, rather than being the sole method of working adopted by the persons concerned.

Hence, it may be the case that further adoption of teleworking could come about as much through existing teleworkers increasing the proportion of work they do in this way, as staff commencing to telework for the first time. Increased flexibility in working hours may also be particularly important in terms of the effects on public transport peak demand.

The type of work likely to shift toward teleworking will thus depend on the nature of work done by individuals, rather than be common to an industrial sector as a whole. While certain types of work are clearly excluded, due to the need for face-to-face presence (for example, most medical treatment, hotels and catering), in other cases a partial shift is likely to occur, varying greatly by individual and type of work concerned.

Another underlying factor is that younger workers appear to be more strongly geared to using all forms of e-communication, and hence as the older staff are replaced, a shift to this method of work might be expected. In sectors with high staff turnover, or an emphasis on younger workers, the effects are likely to be more rapid.

Conversely, in some sectors, such as financial services, a strong premium may still be placed on interaction at the workplace between colleagues, making working from home less appropriate. Hence, a fairly traditional pattern of working fixed hours at the employer's workplace may continue for some types of work. The continued strong growth in employment at Canary Wharf in London (a major financial centre, east of the traditional central area) could be seen as an example of this.

Much of the existing data on employment, and future predictions, is based on sectors within the economy, rather than individual staff classified by type of work done. However, this does indicate a shift toward those sectors which may be more likely to adopt teleworking, especially in Greater London, given the minimal role of manufacturing, and a strong emphasis on the business and service sectors.

Projections for London are provided by Cooper (2006). Anticipated changes between 2006 and 2019 in sectors such as business services (+13%), and decline in manufacturing etc (-26%) clearly point to scope for teleworking, business services rising from 25% of all employment in 2006, to 29% in 2019. However, it should be noted that some other sectors also showing growth would still be dependent on physical presence of most workers, notably hotels and restaurants, and transport and communications (+14%).

From the viewpoint of large organisations, opportunities to reduce their own direct costs arise when 'downsizing' accommodation for a similar size of workforce, or enabling a larger workforce to be employed without corresponding additional space being required.

Despite the potential for teleworking, it is of interest to note that the 2006 NTS survey¹ shows a very similar distribution of working at home to the 2002-2004 data set, about 3.6% of the total sample working at home or the same building as home every day, and about 5.7% working from home at 'least once a week' (4.9% in the 2002-2004 data set). In 2005, a further 6.7% worked at home 'less than once a week but at least once a year' (6.3% in the 2002-2004 data set). Given that sampling will produce some year-to-year fluctuation in any case, this does not indicate any dramatic change. However the proportion saying that working at home would never be possible without a computer rose to 79%, from 72% in 2004. The Department for Transport (2007) notes that over the ten-year period to 2005, NTS data indicate that the proportion of workers who usually work from home did not appear to have increased, but that there was evidence that more of those who could work from home were doing so more often.

IMPLICATIONS FOR POLICY AND FUTURE RESEARCH

The evidence for widespread informal teleworking practices has implications for the appropriate strategy that might be adopted to encourage its wider use. Rather than a 'top down' approach based on formal teleworking policies, it might be more sensible to build on the existing informal practices, which organisations and individuals find easier to adopt, by increasing awareness of

the types of work that can be undertaken in this way. Rather than encourage staff to shift their work wholly to home-based teleworking, it might also be sensible to encourage an increased frequency of teleworking (for example, a shift from 1 to 2 days per week, or from 1 to 2 days per month), by employees already practising teleworking to some extent. There may also be critical points at which an organisation might give fuller consideration to teleworking at a senior management level, notably when decisions on the scale of office accommodation is proposed (such as when a general reduction or expansion of the workforce is taking place).

From the public transport viewpoint, a particular benefit may be obtained through reducing (or spreading) demand at peak times (or at least cutting the rate at which additional capacity is required to serve a growing workforce). Policies to encourage teleworking could work in tandem with greater variation in pricing by time of day.

While perceptions of employers and data such as that from the NTS, are very valuable (and the continuous nature of the NTS will provide very useful monitoring of trends in working at home), it would be useful to have a more direct picture of teleworkers' own activities and perceptions, especially to understand how they currently use their time, and responses to time savings made possible through reduced commuting.

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All inferences drawn from data, and views expressed, in this paper are those of the authors.

Notes

Data from the NTS for 2002 to 2004 was made available by the Department for Transport and analysed by the authors. Principal findings re working at home are published in the NTS annual reports - see for example, 'National Travel Survey: 2006' Department for Transport Statistics Bulletin SB(07)21, September 2007, table 6.4. Full definitions of data, sampling etc. in the NTS may be found in Hayllar, O., McDonnell, P., Mottau, C. and Salathiel, D. 'National Travel Survey 2003 and 2004 : Technical Report' Department for Transport 2005.

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